



Canine Research

Study of aggressiveness in livestock-guarding dogs based on rearing method

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ABSTRACT

The return of wolves to the French Alps has resulted in a significant increase in mortality in small ruminants due to predation during the summer grazing period. To counteract this, the French authorities have supported the acquisition of livestock-guarding dogs by providing technical and financial assistance. Unfortunately, some of these dogs show aggression toward humans. The goal of this study was to evaluate the extent to which the manner in which the guarding dogs are reared affects the risk of human-directed aggression. The aggressiveness of 28 dogs that guarded herds was evaluated in the French department of Haute-Savoie. The dogs were divided into 2 categories of risk, low and high, based on behavioral tests and a questionnaire completed by the person who raised the dog. Dogs raised in sheepfolds, using the classical method, isolated from humans, presented a significantly higher risk of aggression directed toward people compared to dogs raised in contact with the family.

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Introduction

The use of livestock-guarding dogs was progressively lost over the last 2 centuries as eradication of predators in Europe and the United States progressed (Gehring et al., 2010). Today, the return of wolves to the Alps has resulted in significant mortality rates in small ruminants during the summer grazing period (DREAL Auvergne-Rhône-Alpes, 2017; Duchamp et al., 2017). Authorities of the French sheep industry have therefore encouraged the use of livestock-guarding dogs within herds (Leclerc et al., 2009; Plisson, 2011). However, the introduction of large dogs allowed to roam freely in alpine pastures is not without risk for hikers. Reports of dogs manifesting aggression to humans that they encounter continue to increase (Leclerc et al., 2009). Within this context, it is important to evaluate traditional methods used to raise dogs. One of the objectives of training is to

ensure that the dogs remain close to ruminants to protect them from attack by wolves. To accomplish this, raisers seek to create an unbreakable bond between the dogs and their herd. To create this link, animal husbandry specialists advise leaving the puppies in sheepfolds from a very young age and dramatically limiting their contact with humans, as recommended by some publications (Hansen & Bakken, 1999; VerCauteren et al., 2012). The goal of this study was to evaluate the extent to which this rearing method affects the risk of human-directed aggression in adulthood.

Materials and methods

Subjects and survey procedures

This study of livestock-guarding dogs was conducted over a nine-month period from December 2013 to August 2014. The study sample included a group of 28 dogs working as guarding dogs for herds of sheep in the Alps in Haute-Savoie. The herds are small (400–800 animals) and are most often guarded by a single dog. The information about the dogs was gathered by a single veterinarian, from the visual examinations of the dogs and from the documents

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provided by their owners. We included dogs aged from 1 to 10 years to evaluate the animals within a real working context. All the animals included in the study were fed according to the food manufacturers' recommendations and were in good physical health.

The guard dogs were evaluated within their herds, under working conditions. As attacks occur more commonly at the night, in the evening the sheep are enclosed with the guard dogs within an electrified fence.

Examinations and data collection

The dogs were tested for the risk of human-directed aggression. The tests were administered by a single investigator, a veterinary doctor who was specially trained to perform the tests. The reaction to the investigator's approach, and then a walker's approach, was evaluated (Van der Borg et al., 1991; Netto and Planta, 1997; Landry, 2011). The investigator was accompanied by the shepherd, whereas the walker approached the flock alone. One to 2 hours after feeding the dog, the owner offered a treat and the manner in which the dog took the treat was used to evaluate the dog's self-control. A clinical examination was performed to test the dogs' tolerance for being handled and to identify the presence of any pain that could lead to aggression. When dogs had previously bitten someone, the victim or a witness was contacted to obtain a detailed description of the incident. The evaluation was performed using a grid to determine the probability and severity of aggressiveness toward people (Appendix 1). This grid contains items related to the investigator's assessment, the dog's physical health, and human-directed aggression. Dogs characterized by a majority of minor or neutral factors were classified as belonging to the group at low risk of human-directed aggression. Dogs characterized by a majority of aggravating or strongly aggravating factors were placed in the group presenting a high risk of human-directed aggression.

The dog owner or breeder (if different from the owner) was then interviewed to collect a detailed history. The investigator assessed the development and interspecies socialization conditions for each puppy (Appendix 2). In the "classical" model for raising a livestock-guarding dog, the puppy is placed in the sheepfold from the age of 7 or 8 weeks, in exclusive contact with the herd, and to not allow it to return to the house, pet it or interact with it outside the context of working with the sheep (Lorenz and Coppinger, 1986; Green and Woodruff, 1990; Hansen & Bakken, 1999; VerCauteren et al., 2012). In the "mixed" model, the puppies are raised in the sheepfold, but the restrictions regarding isolation from humans are not implemented. The puppy can engage in friendly contact with humans in the form of petting or playing games and can periodically live with the owner or familiar individuals.

Statistical analyses

A Fisher's exact test was used to determine whether there was any association between classical rearing methods and an elevated risk of human-directed dog aggression. A value of $P < 0.01$ was considered to be highly significant. R statistical software (Lucent Technologies, Murray Hill, New Jersey, USA) was used to collect data and to perform analyses.

Results

Of the 28 dogs in the study, 12 had not been raised exclusively in sheepfolds and 16 had been raised exclusively in sheepfolds (Appendix 3). The average age of the sample population was 5 years old. Most of the dogs studied had a physical appearance similar to the Pyrenean mountain dogs, based on World Canine Organization breed standards. One dog was of unknown breed. The size of the

dogs ranged from 60 to 80 cm at the withers. Most of the dogs were male (20/28). One of the female dogs was sterilized, and none of the males were castrated. Five female dogs (5/8) and 7 male dogs (7/20) were reared according to the mixed model. There was no significant difference in the distribution of male dogs and female dogs between the 2 rearing models.

One female dog (1/8) and 7 male dogs (7/20) were determined to be at high risk of exhibiting human-directed aggression. There was no significant difference between male and female dogs with respect to how dangerous the behavior exhibited was. Differences in response to the investigator and walker approach were weak. In general, dogs appeared friendlier in the presence of the investigator, trained in the approach of livestock-guarding dogs and accompanied by the shepherd.

Of the high-risk dogs, 7 (7/8) were difficult to examine and/or would have required sedation for a decent examination. One (1/8) had back pain.

Half of the dogs (8/16) raised exclusively in sheepfolds were determined to be at high risk of exhibiting human-directed aggression. Among these, 4 had severely bitten humans. Three of the 4 aggressive episodes were offensive. One bite had occurred during a dog fight and another had occurred when a stranger handled a sheep. One dog had bitten several walkers approaching the sheep flock. One fearful dog had exhibited aggression in a defensive situation.

All the dogs that were not exclusively raised in sheepfolds (12/12) presented a low level of risk. However, 2 dogs in this group had bitten humans without perforating the skin. The aggressive behavior was defensive in both cases. One female dog had bitten a shepherd caring for a sheep, and another female dog had bitten a hiker who had waved a stick.

The dogs raised exclusively in sheepfolds presented a significantly higher risk of exhibiting human-directed aggression than dogs raised in a family environment ($P = 0.0084$; $P < 0.01$).

Discussion

The sample size was limited by the difficult conditions, in terms of both the altitude and the wide geographical distribution of the study areas. This should therefore be considered a preliminary study.

The investigator is a veterinary doctor. She cares for livestock-guarding dogs and has good knowledge of the pastoral world. These qualities were essential to obtaining reliable data. However, for a study on a larger scale, several investigators would be required to limit bias related to data collection.

The rearing method consisting in raising dogs exclusively in sheepfolds pursues a particular objective. The goal of these practices is to promote an exclusive attachment between the puppy and the herd. Thus, the dog stays with the herd and can defend it effectively against attacks (Dawydiak and Sims, 2004). Following the same reasoning, any interaction with man could promote an attachment to humans and distract the puppy, and thus the dog, from its herd (Wick, 2002). This rearing method isolates the puppy from humans for the entire period during which it is sensitive to intraspecific and interspecific social exposure, between 3 and 12 weeks of age. This lack of social exposure results in a decreased willingness to approach and/or interact with humans (Arai et al., 2011; Kutsumi et al., 2013).

The quality of early puppy social exposure is not the only factor influencing the behavior of dogs in adulthood. The presence of other livestock-guarding dogs in the group can modulate the level of aggressiveness toward humans (Kneafsey and Condon, 1995; Raghavan, 2008). In our survey, most of the dogs worked alone in alpine pastures. When several livestock-guarding dogs were present, all were included in the study.

The high-risk dogs were difficult to examine and/or would have required sedation for a decent examination or had back pain. Some of these dogs may have been painful. They do tough work in difficult terrain and likely do not have the advantage of veterinary care early in the development of a condition or pain. Pain may make any dog more reactive and increase the risk of human-directed dog aggression (Wake et al., 2009). Dogs who are house raised may well get different care.

Other interventions that could reduce the number of livestock attacks, in addition to dogs, include electrified fences, fladry, and the permanent presence of shepherds in mountain pastures (Ciucci and Boitani, 1998; Espuno et al., 2004; Hansen, 2005; Young et al., 2015). In this study, the sheep were protected by electrified fences every night, and the presence of shepherds with the herds was permanent.

In conclusion, this study demonstrates a significant difference in the level of risk between livestock-guarding dogs raised in sheepfolds and those raised partly in the house, in contact with humans. Thus, there is a link between rearing methods and aggression to unfamiliar humans in adult-guarding dogs. These results need to be confirmed by a larger scale study. Future studies should also explore the dogs' effectiveness and evaluate the extent to which a familial rearing method affects their ability to repel wolf attacks.

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Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.jvbe.2018.03.001>.

Ethical considerations

The tests performed in the Alps were conducted in a manner that respected the animals and humans that were involved. The tests were performed in a manner designed to prevent the risk of injuries associated with dog bites or conflict between the sheep and the dogs.

Conflict of interest

No conflict of interest has been declared.

References

Arai, S., Ohtani, N., Ohta, M., 2011. Importance of bringing dogs in contact with children during their socialization period for better behavior. *J. Vet. Med. Sci.* 73, 747–752.

- Ciucci, P., Boitani, L., 1998. Wolf and dog depredation on livestock in central Italy. *Wildlife Soc. B* 26, 504–514.
- Dawydiak, O., Sims, D.E., 2004. *Livestock Protection Dogs: Selection, Care and Training*, 2nd ed. Alpine Publications, Loveland, USA.
- Duchamp, C., Chapron, G., Gimenez, O., Robert, A., Sarrazin, F., Beudels-Jamar, R., Le Maho, Y., 2017. Expertise collective scientifique sur la viabilité et le devenir de la population de loups en France à long terme sous la coordination ONCFS-MNHN. Available at: http://patrinat.mnhn.fr/images/COMMUNICATION/SUPPORTS/AUTRES_RAPPORTS/Expertise_Collective_Loup_04.04.2017.pdf. Accessed June 10, 2017.
- DREAL Auvergne-Rhône-Alpes, 2017. Dommages sur les troupeaux domestiques. Available at: <http://www.auvergne-rhone-alpes.developpement-durable.gouv.fr/protocole-dommages-a3854.html>. Accessed June 10, 2017.
- Espuno, N., Lequette, B., Pouille, M.L., Migot, P., Lebreton, J.D., 2004. Heterogeneous response to preventive sheep husbandry during wolf recolonization of the French Alps. *Wildlife Soc. B* 32, 1195–1208.
- Gehring, T.M., Vercauteren, K.C., Landry, J., 2010. Livestock protection dogs in the 21st century: is an ancient tool relevant to modern conservation challenges. *Agric. Inf. Bull.* 588, 1–33.
- Green, J., Woodruff, R., 1990. Livestock guarding dogs: protecting sheep from predators. *Agriculture Information Bulletin (USA)*, 588, pp. 1–33. Available at: <http://agris.fao.org/agris-search/search.do?recordID=US9132292>. Accessed December 5, 2016.
- Hansen, I., 2005. Use of livestock guarding dogs in Norway—a review of the effectiveness of different methods. *Carniv. Damage Prev. News* 8, 2–8.
- Hansen, I., Bakken, M., 1999. Livestock-guarding dogs in Norway: Part II: different working regimes. *J. Range Manag.* 52, 312–316.
- Kneafsey, B., Condon, K.C., 1995. Severe dog-bite injuries, introducing the concept of pack attack: a literature review and seven case reports. *Injury* 26, 37–41.
- Kutsumi, A., Nagasawa, M., Ohta, M., Ohtani, N., 2013. Importance of puppy training for future behavior of the dog. *J. Vet. Med. Sci.* 75, 141–149.
- Leclerc, M.C., Masselin-Sylvain, S., Lopez, C., Lucbert, J., 2009. Programme National « chien de protection des troupeaux » pour réaliser le recensement et l'évaluation de l'efficacité des chiens de protection des troupeaux et faciliter leur introduction par les éleveurs dans leur troupeau. Available at: www.pyrenees-pireneus.com/Pastoralisme/Chiens/Chiens-Protection-Patou/2009-05-00-Programme-national-chiens-protection-troupeaux.pdf. Accessed December 5, 2016.
- Landry, J.M., 2011. An approach test to determine if individual livestock guarding dogs could be a danger to humans. *J. Vet. Behav. Clin. Appl. Res.* 6, 61.
- Lorenz, J., Coppinger, L., 1986. *Raising and Training a Livestock-Guarding Dog*. Oregon State University Extension Service, Corvallis, USA. Publication EC 1238.
- Netto, W.J., Planta, D.J.U., 1997. Behavioural testing for aggression in the domestic dog. *Appl. Anim. Behav. Sci.* 52, 243–263.
- Plisson, A.L., 2011. Etude de la vulnérabilité des troupeaux ovins à la prédation du loup dans le parc naturel régional du Queyras. Available at: www.parcs-naturels-regionaux.fr/sites/federationpnr/files/document/centre_de_ressources/archive_avant_2016/142533/L/LouppredationQUEYRAS.pdf. Accessed December 5, 2016.
- Raghavan, M., 2008. Fatal dog attacks in Canada, 1990–2007. *Can. Vet. J.* 49, 577–581.
- Van der Borg, J.A.M., Netto, W.J., Planta, D.J.U., 1991. Behavioural testing dogs in animal shelters to predict problem behaviour. *Appl. Anim. Behav. Sci.* 32, 237–251.
- Vercauteren, K., Lavelle, M., Gehring, T., 2012. Cow dogs: use of livestock protection dogs for reducing predation and transmission of pathogens from wildlife to cattle. *Appl. Anim. Behav. Sci.* 140, 128–136.
- Wake, A.A., Minot, E.O., Stafford, K.J., Perry, P.E., 2009. A survey of adult victims of dog bites in New Zealand. *N. Z. Vet. J.* 57, 364–369.
- Wick, P., 2002. *Le chien de protection sur troupeau ovin*, 2nd ed. Artus Editions, Chécy, FR.
- Young, J.K., Miller, E., Essex, A., 2015. Evaluating fladry designs to improve utility as a nonlethal management tool to reduce livestock depredation. *Wildlife Soc. B* 39, 429–433.